



24 JAN 2005



(43) International Publication Date
5 February 2004 (05.02.2004)

PCT

(10) International Publication Number
WO 2004/011929 A1

(51) International Patent Classification⁷: G01N 33/00,
27/12, 27/30

(21) International Application Number:
PCT/GB2003/002991

(22) International Filing Date: 10 July 2003 (10.07.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0217249.2 25 July 2002 (25.07.2002) GB

(71) Applicants (for all designated States except US):
SCHLUMBERGER TECHNOLOGY B.V. [NL/NL];
Parkstraat 83-89, NL-2514 JG The Hague (NL). PE-
TROLEUM RESEARCH AND DEVELOPMENT
N.V. [NL/NL]; De Ruyterkade 62, Willemstad, Cura-
cao (AN). SCHLUMBERGER CANADA LIMITED
[CA/CA]; 525 - 3rd Avenue S.W., Calgary, Alberta T2P

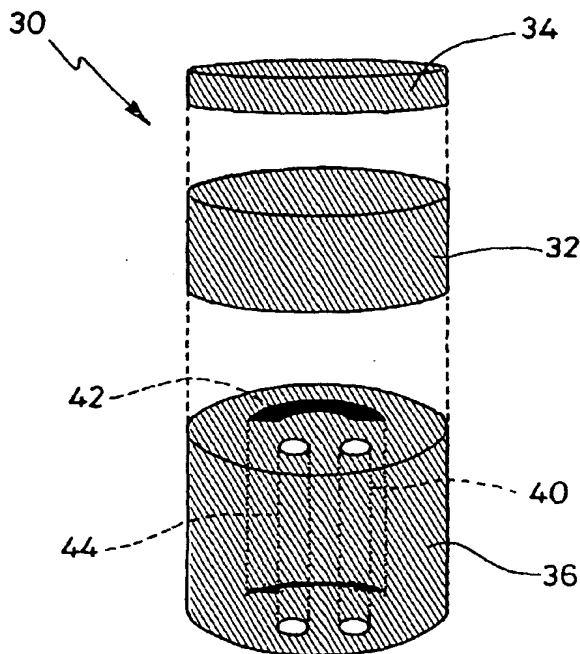
0G4 (CA). SCHLUMBERGER HOLDINGS LIM-
ITED [—/—]; P.O. Box 71, Craigmuir Chambers, Road
Twon, Tortola (VG). SCHLUMBERGER OILFIELD
ASSISTANCE LIMITED [—/—]; Craigmuir Cham-
bers, Road Town, Tortola (VG). SCHLUMBERGER
OVERSEAS S.A. [PA/PA]; 8 Calle Aquilino de la
Guardia, Panama City (PA). SCHLUMBERGER SER-
VICES LIMITED [—/—]; P.O. Box 438, Tortola (VG).
SCHLUMBERGER SURENCO S.A. [PA/PA]; 8 Calle
Aquilino de la Guardia, Panama City (PA). SERVICES
PETROLIERS SCHLUMBERGER [FR/FR]; 42, rue
Saint Dominique, F-75007 Paris (FR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): JIANG, Li
[CN/GB]; 47 Almoners Avenue, Cambridge CB1 8NZ
(GB). JONES, Timothy, Gareth, John [GB/GB]; 16 Den-
mark Road, Cottenham, Cambridgeshire CB4 8QS (GB).
LAWRENCE, Nathan [GB/GB]; Greenlea, 55 Rattle
Road, Westham, Pevensey, East Sussex BN24 5DG (GB).

[Continued on next page]

(54) Title: METHODS AND APPARATUS FOR THE MEASUREMENT OF HYDROGEN SULPHIDE AND THIOLS IN FLU-
IDS



(57) Abstract: An electrochemical sensor for measuring the amount of hydrogen sulphide or thiols in a fluid comprises an electrically conductive porous electrode within which are dispersed a precursor and a reaction solution which together with the hydrogen sulphide or thiols a redox reaction resulting in an electrical current dependent upon the amount of hydrogen sulphide or thiols in the fluid. The reaction solution may be initially provided in the pores of the porous electrode, or derived in use from the fluid itself.

WO 2004/011929 A1



THOMPSON, Mary [GB/GB]; 5 Selby Road, Howden, Goole, East Yorkshire DN14 7 JW (GB). **COMPTON, Richard** [GB/GB]; 17 Blackhall Road, Oxford OX1 3QZ (GB).

(74) **Agent:** **WANG, William, L.**; Intellectual Property Law Department, Schlumberger Cambridge Research Limited, High Cross, Madingley Road, Cambridge CB3 0EL (GB).

(81) **Designated States (national):** AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE,

SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) **Designated States (regional):** ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

Application No

PCT GB 03/02991

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 G01N33/00 G01N27/12 G01N27/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal, COMPENDEX, MEDLINE, EMBASE, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JEROSCHEWSKI P ET AL: "GALVANIC SENSOR FOR DETERMINATION OF HYDROGEN SULFIDE" ELECTROANALYSIS, VHC PUBLISHERS, INC, US, vol. 6, no. 9, September 1994 (1994-09), pages 769-772, XP001023470 ISSN: 1040-0397 page 769, right-hand column figure 1	1,16-25
Y	DATABASE WPI Section Ch, Week 198851 Derwent Publications Ltd., London, GB; Class A89, Page 03, AN 1988-367159 XP002258721 & SU 1 402 914 A (ELECTROCHEM INST), 15 June 1988 (1988-06-15) abstract	1,16-25



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

22 October 2003

Date of mailing of the international search report

10/11/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Michalitsch, R

INTERNATIONAL SEARCH REPORT

Application No
PCT GB 03/02991

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 44 11 370 A (GASTEC CORP) 5 October 1995 (1995-10-05) column 3, line 24-62 column 4, line 32-50 figure 3 ----	1,16-25
Y	DATABASE WPI Section Ch, Week 0204 Derwent Publications Ltd., London, GB; Class E36, AN 2002-026770 XP002258722 & CN 1 168 469 A (METAL CORROSION & PROTECTION INSTITUT), 24 December 1997 (1997-12-24) abstract ----	1,16-25
A	WO 01 63094 A (SCHLUMBERGER HOLDINGS; SCHLUMBERGER SERVICES LTD; SCHLUMBERGER DE PERFI) 30 August 2001 (2001-08-30) the whole document ----	1-32
A	FULTZ M L ET AL: "MEDIATOR COMPOUNDS FOR THE ELECTROCHEMICAL STUDY OF BIOLOGICAL REDOX SYSTEMS: A COMPILATION" ANALYTICA CHIMICA ACTA, ELSEVIER, AMSTERDAM, NL, vol. 140, no. 1, 1982, pages 1-18, XP000853623 ISSN: 0003-2670 page 3 ----	1-3
A	EP 0 299 779 A (STANFORD RES INST INT) 18 January 1989 (1989-01-18) column 3-5 -----	1-27

INTERNATIONAL SEARCH REPORT

Application No
PCT GB 03/02991

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
SU 1402914	A	15-06-1988	SU 1402914 A1	15-06-1988
DE 4411370	A	05-10-1995	GB 2287791 A DE 4411370 A1	27-09-1995 05-10-1995
CN 1168469	A	24-12-1997	NONE	
WO 0163094	A	30-08-2001	GB 2359631 A AU 3211101 A WO 0163094 A1 NO 20024003 A US 2003134426 A1	29-08-2001 03-09-2001 30-08-2001 22-08-2002 17-07-2003
EP 0299779	A	18-01-1989	US 4812221 A AT 124140 T CA 1291208 C DE 3854021 D1 DE 3854021 T2 EP 0299779 A2 JP 1088245 A JP 2070765 C JP 7104322 B	14-03-1989 15-07-1995 22-10-1991 27-07-1995 02-11-1995 18-01-1989 03-04-1989 10-07-1996 13-11-1995